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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/771,391	02/05/2004	Kozo Shimizu	042080	3325
38834	7590	04/18/2005	EXAMINER	
WESTERMAN, HATTORI, DANIELS & ADRIAN, LLP 1250 CONNECTICUT AVENUE, NW SUITE 700 WASHINGTON, DC 20036			GURLEY, LYNNE ANN	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 04/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/771,391

Applicant(s)

SHIMIZU ET AL.

Examiner

Lynne A. Gurley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 November 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

  
LYNNE A. GURLEY

PRIMARY PATENT EXAMINER

TC 2800, AU 2812

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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### **DETAILED ACTION**

This Office Action is in response to the RCE filed 4/7/05.  
Currently claims 1-8 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/7/05 has been entered.

#### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

#### ***Drawings***

1. The replacement drawings for figures 5A-5C were received on 11/2/04. These drawings are replacement sheets for Figures 5A-5C only. The drawings previously filed on 2/5/04 are approved for figures 1-4.

#### ***Specification***

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

#### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2 and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by

Nishiguchi (US 5,461,261, dated 10/24/95).

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5. Nishiguchi shows the method as claimed in figures 3-19 and corresponding text, with emphasis on figures 3, 11 and 13-19, as: forming an insulating film (105 –figs. 11&15; 106 – figs. 13&18) on a surface of a semiconductor element or a circuit wiring board having electrodes 100/101-104 (also column 3, line 67; column 4, lines 1-2) on the surface thereof; forming openings (figs. 11, 13 &18) in the insulating film by patterning the insulating film and then removing portions of the insulating film above the electrodes; supplying a first metal into the openings; heating the first metal to melt and coagulate the first metal; supplying a second metal into the openings on the first metal; heating the first metal and the second metal to melt and coagulate the first and the second metal (alternate layers of two different metals capable of eutectic bonding upon mounting are deposited by electroplating, melting and coagulation occurs between each layer, and the entire bump is melted and coagulated; See column 2, lines 25-31; column 3, lines 58-65; column 4, lines 28-38; column 5, lines 12-67 for materials including Sb, In, number of layers, which includes the structure of only two metal layers, melting in the eutectic bonding, and electroplating; column 6, lines 1-26 for dry resist, height of the metal layers including mushroom effect above the insulator); and removing the insulating film (column 6, line 27).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nishiguchi (US 5,461,261, dated 10/24/95) in view of Nakata et al. (US 2004/0079194, dated 4/29/04).

Nishiguchi shows the method substantially as claimed and as described in the preceding paragraphs.

Nishiguchi lacks anticipation only in not teaching that: 1) the first metal has a characteristic in which a volume thereof is increased when it is heated to be molten and coagulated; 2) the first metal contains as a component thereof Bi or an alloy including Bi as a primary component; and 3) a content of Bi in the first metal is in the range from 20 to 70 wt% of the sum of the first metal and the second metal.

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Nakata teaches the use of Bi (0.5 to 15% by weight) in a Sn composition, since Bi forms a low melting point alloy phase with Sn.

It would have been obvious to one of ordinary skill in the art to have had the first metal have a characteristic in which a volume thereof is increased when it is heated to be molten and coagulated; to have had the first metal contain as a component thereof Bi or an alloy including Bi as a primary component; and to have had a content of Bi in the first metal in the range from 20 to 70 wt% of the sum of the first metal and the second metal, in the method of Nishiguchi, with the motivation that Nakata teaches that it is well known to include Bi in a Sn alloy and since Bi also forms a low melting point alloy phase with Sn, the Bi would preserve the eutectic properties of the bump formed in Nishiguchi. Additionally, since Nakata teaches the 0.5 to 15% composition of Bi by weight, in the absence of criticality, this range is shown to be on the same order of the 20 to 70% in the instant application and, therefore would be obvious to one of ordinary skill in the art. Finally, the addition of Bi in the method of Nishiguchi, would make the volume of the first metal increase when it is heated to be molten and coagulated, since it is characteristically hard and brittle.

### ***Response to Arguments***

10. Applicant's arguments, see pages 5-7 of the RCE, filed 4/7/05, with respect to the rejection(s) of claim(s) 1-8 under 35 U.S.C. 102 and 103 have been fully considered but they are not persuasive. Nishiguchi performs the steps in order. The broadest interpretation of Applicant's claim language does not preclude intervening metal layers or steps because of the "comprising" language used. The steps are still performed in order in Nishiguchi, however,

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other steps may intervene. In response to Applicant's remarks, regarding the heating step between the steps of "supplying a first metal into the opening" and "supplying a second metal into the openings on the first metal", Nishiguchi shows the heating step by describing a eutectic alloy reaction taking place between the layers, followed by the entire bump being softened (column 3, lines 58-67; column 4, lines 25-39; column 5, lines 36-45). The eutectic temperature is the lowest possible melting temperature of the mixture of both metal layers, so that it appears that, inherently, Nishiguchi shows that the metals are exposed to an elevated temperature or heating step as the layers are formed on one another.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lynne A. Gurley  
Primary Patent Examiner  
TC 2800, Art Unit 2812

LAG  
April 12, 2005